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Checklist of the fish fauna of the Araçá Bay, São Sebastião Channel, northern coast of São Paulo, Brazil

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Abstract: This paper presents for the first time a checklist of the fish fauna of Araçá Bay, São Sebastião Channel, northern coast of São Paulo state, Brazil. Fishes were sampled in five surveys from October 2012 to February 2014 using nine different types of sampling gear during high tide. Tide pool fishes were also sampled in four surveys from March to October 2014. Geographic distribution and conservation status of each species are reported. A total of 126 species was recorded in Araçá Bay, including two non-native species and new records in the São Sebastião region for 16 species. The fish species richness found in Araçá Bay was greater than the previously recorded for the São Sebastião Channel and other adjacent areas. Most of the Araçá fish species show a wide distribution along the western Atlantic Ocean (32%). Few species are included in the international (29%) and Brazilian (3.3%) official lists of threatened species.

Key words: species inventory; species richness; geographic distribution; conservation status; multi-gear approach

INTRODUCTION

Araçá Bay is a large tidal flat ecosystem located in São Sebastião Channel (SSC) on the northern coast of São Paulo state, adjacent to the São Sebastião Port (Figure 1). It harbors an exceptionally rich macrofauna, including one of the last relicts of mangrove on the São Sebastião coast (Amaral et al. 2010). The port was built in 1936, and since then, its operation, expansion and consequent surrounding urbanization have severely affected the bay's biodiversity (Migotto et al. 1993; Zanardi et al. 1999; Amaral and Nallin 2011). Furthermore, in the 1980s, a submarine sewer was built in the bay, which has caused drastic changes on its morphology and circulation (Teodoro et al. 2011; Amaral et al. 2010; Migotto et al. 1993). Currently, there is a project to expand the São Sebastião Port toward the bay. A loss of habitat and an increase in water pollution is expected along with the port expansion, and these are expected to affect the bay's ecosystem and consequently its fish community (Consultoria Paulista de Estudos Ambientais 2011).

Several studies of the benthic fauna have been carried out at Araçá Bay (Migotto et al. 1993; Arruda and Amaral 2003; Petracco et al. 2013; Corte et al. 2014; Gorman et al. 2015), but the fish fauna of this bay is still largely unknown, despite its high importance for local fishermen. Available information of the fish fauna is restricted to bottom-trawl surveys (Muto et al. 2000; Rossi-Wongtschowski et al. 2008) and diving surveys (Gibran and Moura 2012) conducted in São Sebastião Channel and on the adjacent continental shelf.

Checklists of species are essential for effective management of ecosystems, as well as for development of conservation plans and environmental impact studies (Silveira 2011; Mace 2004; Hellman and Fowlle 1999). Additionally, comprehensive local inventories may increase our knowledge of the distribution ranges of species and thus provide support to biogeographical and macroecological studies (Silveira et al. 2010). Here, we provide a checklist of fishes from Araçá Bay. We include their geographic distributions and conservation status. The efficiency of the sampling gear used here, and the spatial and temporal variability in the species composition and abundance of the bay will be addressed in future studies.

MATERIALS AND METHODS

Araçá Bay is composed by four sand beaches, two small islets, three small mangrove patches and a large sand-mud sediment tidal plain. It is limited northward by a rockfill and southward by rocky shores (Figure 1). The maximum depth of the bay is 10 m at its mouth, becoming shallower towards its inner part. At high tide during neap tides, the mean depth from the inner part of the bay to the islets is 0.73 ± 0.25 m (SD), and from

Figure 1. Map of the Araçá Bay at the continental margin of the São Sebastião Channel (SSC), northern coast of São Paulo, Brazil. The arrow indicates Mãe Isabel Creek. São Sebastião Island (SSI); São Sebastião Port (SSP). A: intertidal; B: shallow sublittoral; C: outer sublittoral.

the islets to the bay's mouth is of 1.16 ± 0.53 m. The bay's configuration prevents it from being directly influenced by the relatively strong SSC hydrodynamics, thus, the main abiotic driver in the bay is the tide (Amaral et al. 2010; Gubitoso et al. 2008).

For our purposes, we divided the bay into three sectors: intertidal, shallow sublittoral and outer sublittoral (Figure 1). Fishes were collected in five surveys: October 2012, March, July, October 2013 and January 2014. The nine types of gear used in each survey and the number and location of deployments are described below:

1. One cast-net (6.65 m diameter with a 10 mm monofilament mesh between adjacent knots) was used in both intertidal and shallow sublittoral sectors, with 18 random and independent deployments in each sector.
2. One otter trawl (two paired nets each with 9.5 m opening, 6.7 m cod-end, and 10 mm between adjacent knots) was operated in the shallow and outer sublittoral, performing four and three random and independent 100 m tows, respectively.
3. Two encircling gillnets were deployed; one (590 m long, 3 m high, and 30 mm stretched mesh) was used in the shallow sublittoral with two random and independent deployments; another encircling gillnet (220 m long, 2.6 m hight, and 32 mm stretched mesh) was used in the intertidal, with one deployment at Mãe Isabel creek (Figure 1), and two deployments in the inner sublittoral, one near the rocky shore located south

of the inner sublittoral and another near the port.

4. Two gillnets, with net 1 (154 m × 2.6 m with 32 mm stretched mesh) deployed between the two inlets in the intertidal, and net 2 (longer part = 154 m × 3.3 m and smaller part = 85.8 m × 3.15 m; 50 mm stretched mesh at both parts) deployed in the southern part of the inner sublittoral from the shore (Figure 1). Each net was operated over 12 hours (~ 7 p.m. to ~ 7 a.m.), being checked at each 2 hours.
5. Six fish traps (150 cm wide × 53 cm long × 37 cm high, 15 mm monofilament line mesh) deployed over the rocky bottom in the southern part of the outer sublittoral.
6. One beach seine (20 m long × 3 m high, with a 15 m long bag) performing 4 to 5 tows in the margins of the intertidal and 1 to 3 tows in the margins of the inner subtidal.
7. One set of handline (15 to 20 size 6 hooks baited with sardines) used over the rocky bottom of the southern part of the outer sublittoral (Figure 1).

One night was required to operate each gear (except for the fish trap, which was continuously operated throughout the day and night over five successive days, and the handline, which was operated in the daytime from approximately 5:00 a.m. to 10:00 a.m.). After the captures, fishes were stored in ice and transported to the laboratory to be identified.

Fishes inhabiting tide pools were sampled during low tide of spring tide in four surveys: March, June, August, and October 2014. The fishes were captured (I) with hand net in the rock and rock-sand pools after dissolving a clove oil solution (4% in alcohol); and (II) with a mosquito-screen-made beach seine (2.5 m long, 3.0 mm mesh) and hand nets in soft-sediment pools (for more details on the sampling procedure, see Brenha-Nunes et al. 2016). All specimens were preserved in 70% alcohol solution and later identified in laboratory.

The taxonomic identity of the specimens was identified based on Figueiredo (1977), Figueiredo and Menezes (1978, 1980 and 2000), Menezes and Figueiredo (1980 and 1985) and on Carpenter (2002a, 2002b and 2002c). The taxonomic classification follows Eschmeyer (2014). The Chico Mendes Institute for Biodiversity Conservation granted permission for the capture and transportation of the fishes (Permit No. 5574607). Species vouchers are deposited in the Zoological Museum of the University of São Paulo. Voucher numbers are presented in the Appendix, Table A1.

The species were ranked according to the biogeographical categories proposed by Passos et al. (2012), as follow: CT – Circumtropical (throughout the tropics); TA - Trans-Atlantic (western and eastern sides of the subtropical and tropical Atlantic Ocean); WA - Western Atlantic (western side of the subtropical and tropical North and South Atlantic Ocean, with the northern subtropical limit at South Carolina, USA); SWA - Southern West Atlantic (northern Brazil to Argentina); SSWA - Southern South West Atlantic (southeastern Brazil to Argentina); Ca – Caribbean (Florida, USA, to Venezuela); Br – Brazilian Province (between the Orinoco delta, Venezuela, and Santa Catarina, Brazil); EA – Eastern Atlantic (eastern side of the subtropical and tropical North and South Atlantic Ocean); and EP - Eastern Pacific (eastern side of the subtropical and tropical Pacific Ocean). Several species have a geographic distribution that does not fit exactly with the biogeographical categories proposed. For such cases, we combined two or three biogeographical categories in order to comply with their distribution.

The conservation status of species was verified in the 'IUCN Red List of Threatened Species' (IUCN 2014), the Brazilian federal list for threatened species, Ordinance of the Ministry of Environment nº 445, December 17 of 2014 (Brasil 2014), and the São Paulo state list for threatened species, Decree Nº 60.133 of February 7 of 2014 (Governo do Estado de São Paulo 2014).

RESULTS

A total of 126 species were captured, including five elasmobranches (rays) and 121 teleosts belonging to 19 orders and 54 families (Table 1). Photographs of these species were already published by Rossi-Wongtschowski et al. (2015). The richest order was Perciformes (69 spp.), followed by Clupeiformes (9 spp.), and Pleuronectiformes (9 spp.). The richest families were Carangidae (11 spp.), Sciaenidae (9 spp.), Haemulidae, Gobiidae and Paralichthydae (6 spp. each), and Engraulidae and Gerreidae (5 spp. each). Two non-native, Indo-Pacific species, *Omobranchus punctatus* (Valenciennes, 1836) (Contente et al. 2015) and *Butis koilomatodon* (Bleeker, 1849) (Contente et al. 2016), were recorded.

When compared to another comprehensive species checklist for the São Sebastião region (Lamas, 2015), 16 species captured in Araçá Bay were recorded for the first time from the region: *Achirus lineatus* (Linnaeus, 1758), *Astroscopus y-graecum* (Cuvier, 1829), *Ctenogobius smaragdus* (Valenciennes, 1837), *Elops saurus* Linnaeus, 1766, *Gobionellus stomatus* Starks, 1913, *Hemicaranx amblyrhynchus* (Cuvier, 1833), *Lutjanus cyanopterus* (Cuvier, 1828), *Microgobius meeki* Evermann & Marsh, 1899, *Mugil hospes* Jordan & Culver, 1895, *Myrophis punctatus* Lütken, 1852, *Omobranchus punctatus*, *Butis koilomatodon*, *Sphoeroides testudineus* (Linnaeus, 1758), *Strongylura marina* (Walbaum, 1792), *Trachinocephalus myops* (Forster, 1801), and *Tylosurus acus* (Lacepède, 1803).

Most of the species from Araçá Bay (32%) are largely distributed throughout the subtropical and tropical Western Atlantic Ocean, while 25% belong to the

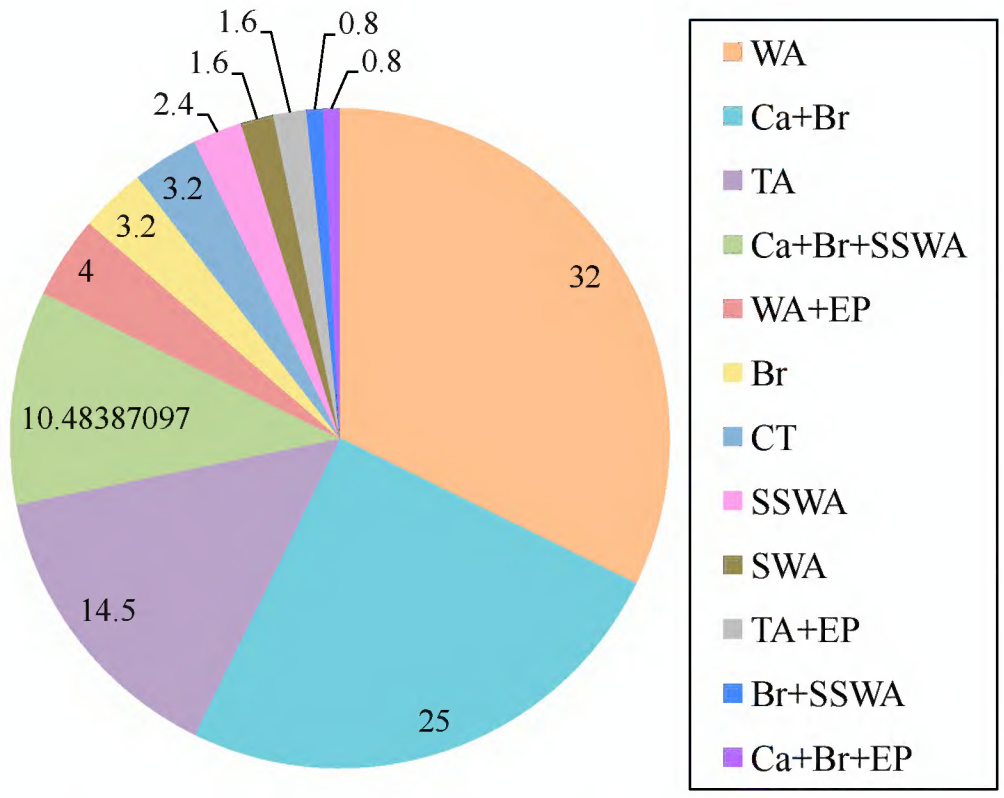

Figure 2. Relative frequency of the geographic distribution categories of species recorded in Araçá Bay, São Sebastião, SP (Total richness = 126). CT: Circumtropical; TA: Trans-Atlantic; WA: Western Atlantic; SWA: Southern West Atlantic; SSWA: Southern South West Atlantic; Ca: Caribbean; Br: Brazilian Province; EA: Eastern Atlantic; EP: Eastern Pacific.

Caribbean and Brazilian Province (a combination of the Ca and Br categories). A total of 3.2% species is restricted to the Brazilian Province, and 2.4% are distributed along the southern part of the Western Atlantic (Figure 2).

The conservation status of fish species from Araçá Bay is shown in the Table 1, and the relative frequency of each category is shown in the Figure 3. Only 29% of the species are ranked within one of the IUCN Red List categories: four species are Data Deficient (DD), 26 are Least Concern (LC), two are Near Threatened (NT; *Albula vulpes* (Linnaeus, 1758) and *Rhinobatos percellens* (Walbaum, 1792)), three are Vulnerable (VU; *Gymnura altavela (Linnaeus, 1758)*, *Lutjanus analis* (Cuvier, 1828) and *Lutjanus cyanopterus*), and one species is Endangered (EN; *Epinephelus marginatus* (Lowe, 1834)). According to the Brazilian federal list, only four species are assessed with a Red List category: two species are VU (*Hippocampus reidi* Ginsburg, 1933 and *Lutjanus cyanopterus*), and two species are Critically Endangered (CR; *Epinephelus marginatus* and *Gymnura altavela*). On the other hand, according to the state list, approximately 50% of species are included in some category: 38 species are ranked as DD, eight as Fisheries Management Plan Required (FMPR; *Epinephelus marginatus*, *Hippocampus reidi*, *Lutjanus analis*, *Lutjanus cyanopterus*, *Micropogonias furnieri* (Desmarest, 1823), *Mugil liza* Valenciennes, 1836, *Rhinobatos percellens* and *Sardinella brasiliensis* (Steindachner, 1879)), and nine as NT (*Anchoviella lepidentostole* (Fowler, 1911), *Centropomus parallelus* Poey, 1860, *Centropomus undecimalis* (Bloch, 1792), *Cynoscion jamaicensis* (Vaillant & Bocourt, 1883), *Menticirrhus americanus* (Linnaeus, 1758), *Opisthonema oglinum* (Linnaeus, 1758), *Orthopristis ruber* (Cuvier, 1830), *Pomatomus saltatrix* (Linnaeus, 1766) and *Selene setapinnis* (Mitchill, 1815)).

DISCUSSION

The fish fauna of Araçá Bay is composed of the same pool of species found in other areas along the southeastern Brazilian coast, such as Sepetiba Bay, Rio de

Table 1. Fish species recorded in Araçá Bay, São Sebastião Channel, northern coast of São Paulo, Brazil. Geographic distribution categories (GD); conservation status of the species: the IUCN Red List of Threatened Species (IUCN 2014), the Ordinance of the Ministry of Environment nº 445, of 17 December 2014 (BR) (Brasil 2014) and the Decree Nº 60.133 of 7 February 2014 (SP) (Governo do Estado de São Paulo 2014). No geographic distribution category was attributed for *Omobranchus punctatus*, and *Butis koilomatodon* since they are originally from the Indo-Pacific. Abbreviations of geographic distribution and conservation status are in figure 2 and 3, respectively. * Species for which vouchers are not available, due to problems in the preservation of the exemplars.

Species	Local common names	English common names	Distribution	IUCN	BR	SP
ELASMOBRANCHII						
TORPEDINIFORMES						
Narcinidae						
Narcine brasiliensis (Olfers, 1831)*	Raia-elétrica, Treme-treme	Brazilian Electric Ray	WA	DD	NE	DD
RAJIFORMES						
Rhinobatidae						
Rhinobatos percellens (Walbaum, 1792)	Raia-viola	Chola Guitarfish	TA	NT	NE	NFMP
MYLIOBATIFORMES						
Dasyatidae						
Dasyatis guttata (Bloch & Schneider, 1801)	Raia-lixa, Raia-branca	Longnose Stingray	Ca+Br	DD	NE	DD
Dasyatis hypostigma Santos & Carvalho, 2004	Raia-manteiga, Raia-prego	Bluntnose Stingray	SSWA	DD	NE	DD
Gymnuridae						
Gymnura altavela (Linnaeus, 1758)*	Raia-amarela, Raia-borboleta	Spiny Butterfly Ray	TA	VU	CR	DD
ACTINOPTERYGII						
ELOPIFORMES						
Elopidae						
Elops saurus Linnaeus, 1766	Ubarana	Ladyfish	Ca+Br	LC	NE	NE
ALBULIFORMES						
Albulidae						
Albula vulpes (Linnaeus, 1758)	Ubarana-focinho-de-rato	Bonefish	CT	NT	NE	NE

Continued

Table 1. *Continued.*

Species	Local common names	English common names	Distribution	IUCN	BR	SP
Anguliformes						
Muraenidae						
Gymnothorax ocellatus Agassiz, 1831	Moréia, Moréia-pintada	Ocellated Moray	Ca+Br	NE	NE	NE
Ophichthidae						
Myrophis punctatus Lütken, 1852	Moréia, Enguia	Speckled Worm-Eel	WA	NE	NE	NE
Ophichthus gomesii (Castelnau, 1855)	Peixe-cobrado-mar	Shrimp Eel	WA	NE	NE	NE
Clupeiformes						
Clupeidae						
Harengula clupeola (Cuvier, 1829)	Sardinha-cascuda	False Herring, False Pilchard	Ca+Br	NE	NE	DD
Opisthonema oglinum (Lesueur, 1818)	Sardinha-bandeira	Atlantic Thread Herring	Ca+Br	NE	NE	NT
Sardinella brasiliensis (Steindachner, 1879)	Sardinha, Sardinha-verdadeira	Brazilian Sardinella	Ca+Br+SSWA	NE	NE	NFMP
Engraulidae						
Anchoa lyolepis (Evermann & Marsh, 1900)	Manjuba	Shortfinger Anchovy	WA	NE	NE	DD
Anchoa tricolor (Spix & Agassiz, 1829)	Manjuba, Irico	Piquitinga Anchovy	SWA	NE	NE	DD
Anchovia clupeoides (Swainson, 1839)	Sardinha, Manjuba	Zabaleta Anchovy	Ca+Br	NE	NE	NE
Anchoviella lepidentostole (Fowler, 1911)	Manjuba	Broadband Anchovy	Br	NE	NE	NT
Lycengraulis grossidens (Spix & Agassiz, 1829)	Manjuba	Atlantic Sabretooth Anchovy	Ca+Br+SSWA	NE	NE	NE
Pristigasteridae						
Pellona harroweri (Fowler, 1917)	Sardinha-manteiga	American Coastal Pellona	Ca+Br	NE	NE	NE
Siluriformes						
Ariidae						
Genidens genidens (Cuvier, 1829)	Bagre	Catfish	Br	LC	NE	DD
Aulopiformes						
Synodontidae						
Synodus foetens (Linnaeus, 1758)	Peixe-lagarto	Inshore Lizardfish	WA	NE	NE	NE
Trachinocephalus myops (Forster, 1801)	Peixe-lagarto	Snakefish	CT	LC	NE	NE
Mugiliformes						
Mugilidae						
Mugil curema Valenciennes, 1836	Parati	White Mullet	TA+EP	NE	NE	DD
Mugil hospes Jordan & Culver, 1895	Parati	Hospe Mullet	Ca+Br+EP	LC	NE	DD
Mugil incilis Hancock, 1830	Parati	Parassi Mullet	Ca+Br	LC	NE	NE
Mugil liza Valenciennes, 1836	Tainha	Lebranche Mullet	Ca+Br+SSWA	NE	NE	NFMP
Gobiesociformes						
Gobiesocidae						
Gobiesox barbatulus Starks, 1913	Pregador	Lappetlip Clingfish	Ca+Br	NE	NE	NE
Gobiesox strumosus Cope, 1870	Maria-da-toca, Piramangaba	Skilletfish	WA+EP	NE	NE	NE
Atheriniformes						
Atherinopsidae						
Atherinella brasiliensis (Quoy & Gaimard, 1825)	Peixe-rei	Brazilian Silversides	Br	NE	NE	NE
Cyprinodontiformes						
Poeciliidae						
Poecilia vivipara Bloch & Schneider, 1801	Guarú	-	Ca+Br+SSWA	NE	NE	NE
Beloniformes						
Belonidae						
Strongylura marina (Walbaum, 1792)	Agulha	Atlantic Needlefish	WA	LC	NE	DD
Strongylura timucu (Walbaum, 1792)	Agulha	Timucu	Ca+Br	NE	NE	DD
Tylosurus acus (Lacepède, 1803)	Agulhão	Agujon Needlefish	TA	NE	NE	DD
Hemiramphidae						
Hemiramphus brasiliensis (Linnaeus, 1758)	Agulha-preta, Agulhinha	Ballyhoo Halfbeak	TA	NE	NE	DD
Hyporhamphus roberti (Valenciennes, 1847)	Agulha	Slender Halfbeak	Ca+Br	LC	NE	DD
Hyporhamphus unifasciatus (Ranzani, 1841)	Peixe-agulha	Common Halfbeak	Ca+Br+SSWA	NE	NE	DD
Syngnathiformes						
Syngnathidae						
Cosmocampus elucens (Poey, 1868)	Peixe-cachimbo	Shortfin Pipefish	WA	LC	NE	NE
Hippocampus reidi Ginsburg, 1933	Cavalo-marinho	Longsnout Seahorse	WA	DD	VU	NFMP
Scorpaeniformes						
Dactylopteridae						
Dactylopterus volitans (Linnaeus, 1758)	Coió, Voador	Flying Gurnard	TA	NE	NE	NE
Scorpaenidae						
Scorpaena brasiliensis Cuvier, 1829	Mangangá, Beatinha	Barbfish	WA	NE	NE	NE
Scorpaena plumieri Bloch, 1789	Peixe-pedra, Mangangá	Spotted Scorpionfish	TA	NE	NE	NE

Continued

Table 1. *Continued.*

Species	Local common names	English common names	Distribution	IUCN	BR	SP
Triglidae						
Prionotus punctatus (Bloch, 1793)	Peixe-cabra, Cabrinha	Bluewing Searobin	Ca+Br+SSWA	NE	NE	NE
Perciformes						
Centropomidae						
Centropomus parallelus Poey, 1860	Robalo-peva	Fat Snook	Ca+Br	NE	NE	NT
Centropomus undecimalis (Bloch, 1792)	Robalo-flecha	Common Snook	WA	NE	NE	NT
Serranidae						
Diplectrum formosum (Linnaeus, 1766)	Michole-da-areia	Sand Perch	WA	NE	NE	NE
Diplectrum radiale (Quoy & Gaimard, 1824)	Michole-da-areia, Jacundá	Pond Perch	Ca+Br+SSWA	NE	NE	NE
Epinephelus marginatus (Lowe, 1834)	Garoupa, Garoupa-verdadeira	Dusky Grouper	TA	EN	CR	NFMP
Mycteroperca acutirostris (Valenciennes, 1828)	Badejo-mira	Comb Grouper	Ca+Br	LC	NE	NE
Pomatomidae						
Pomatomus saltatrix (Linnaeus, 1766)	Anchova	Bluefish	CT	NE	NE	NT
Carangidae						
Caranx hippos (Linnaeus, 1766)*	Xaréu, Aracimbora	Common Jack, Crevalle Jack	TA	NE	NE	NE
Caranx latus Agassiz, 1831	Xerelete	Horse-eye Jack	TA	NE	NE	NE
Chloroscombrus chrysurus (Linnaeus, 1766)	Palombeta, Carapau	Atlantic Bumper	TA	NE	NE	NE
Hemicaranx amblyrhynchus (Cuvier, 1833)	Cabeça dura, Vento-leste	Bluntnose Jack	WA	NE	NE	NE
Oligoplites saliens (Bloch, 1793)	Guaivira	Castin Leatherjacket	Ca+Br+SSWA	NE	NE	NE
Oligoplites saurus (Bloch & Schneider, 1801)	Tibiro de couro	Leatherjacket	WA+EP	NE	NE	NE
Selene setapinnis (Mitchill, 1815)	Galo	Atlantic Moonfish	WA	NE	NE	NT
Selene vomer (Linnaeus, 1758)	Galo de penacho	Lookdown	WA	NE	NE	NE
Trachinotus carolinus (Linnaeus, 1766)	Pampo	Florida Pompano	WA	NE	NE	NE
Trachinotus falcatus (Linnaeus, 1758)	Sernambiguara	Permit	WA	NE	NE	NE
Trachinotus goodei Jordan & Evermann, 1896	Pampo-galhudo	Great Pompano	WA	LC	NE	NE
Lutjanidae						
Lutjanus analis (Cuvier, 1828)	Caranho-vermelho	Mutton Snapper	WA	VU	NE	NFMP
Lutjanus cyanopterus (Cuvier, 1828)	Caranha	Cubera Snapper	WA	VU	VU	NFMP
Lutjanus synagris (Linnaeus, 1758)	Ariocó, Vermelho-ariocó	Lane Snapper	WA	NE	NE	NE
Gerreidae						
Diapterus rhombeus (Cuvier, 1829)	Carapeba	Caitipa Mojarra	Ca+Br	NE	NE	NE
Eucinostomus argenteus Baird & Girard, 1855	Carapicu	Silver Mojarra	WA+EP	NE	NE	NE
Eucinostomus gula (Quoy & Gaimard, 1824)	Carapicu	Jenny Mojarra	WA	NE	NE	DD
Eucinostomus melanopterus (Bleeker, 1863)	Carapicu	Flagfin Mojarra	TA	NE	NE	NE
Eugerres brasilianus (Cuvier, 1830)	Caratinga	Brazilian Mojarra	WA	NE	NE	DD
Haemulidae						
Anisotremus surinamensis (Bloch, 1791)	Sargo-beiçudo, Sargo-de-beiço	Black Margate	Ca+Br	NE	NE	NE
Anisotremus virginicus (Linnaeus, 1758)	Salema	Porkfish	Ca+Br	NE	NE	NE
Conodon nobilis (Linnaeus, 1758)*	Roncador	Barred Grunt	Ca+Br	NE	NE	DD
Haemulon steindachneri (Jordan & Gilbert, 1882)	Corcoroca-boca-larga, Macasso	Chere-chere Grunt	WA+EP	LC	NE	NE
Haemulopsis corvinaeformis (Steindachner, 1868)	Corcoroca legítima, coró-branco	Roughneck Grunt	Ca+Br	NE	NE	NE
Orthopristis ruber (Cuvier, 1830)	Corcoroca jurumirim, Canguito	Corocoro Grunt	Ca+Br	NE	NE	NT
Sparidae						
Archosargus rhomboidalis (Linnaeus, 1758)	Canhanha, Salema	Sea Bream	WA	LC	NE	NE
Calamus penna (Valenciennes, 1830)	Peixe-pena	Sheepshead Porgy	Ca+Br	LC	NE	NE
Diplodus argenteus (Valenciennes, 1830)	Pargo-branco	Silver Porgy	Ca+Br+SSWA	LC	NE	NE
Polynemidae						
Polydactylus virginicus (Linnaeus, 1758)	Barbudo, Parati-barbudo	Barbu	WA	NE	NE	NE
Sciaenidae						
Ctenosciaena gracilicirrhus (Metzelaar, 1919)	Pescada cascuda, Goretê	Barbel Drum	Ca+Br	NE	NE	NE
Cynoscion jamaicensis (Vaillant & Bocourt, 1883)	Goete	Jamaica Weakfish	Ca+Br+SSWA	NE	NE	NT
Cynoscion leiarchus (Cuvier, 1830)	Pescada-branca	Smooth Weakfish	Ca+Br	NE	NE	DD
Isopisthus parvipinnis (Cuvier, 1830)*	Corvina manteiga, Pescada-mole	Bigtooth Corvina	Ca+Br	NE	NE	NE
Larimus breviceps Cuvier, 1830	Oveva	Shorthead Drum	Ca+Br	NE	NE	NE
Menticirrhus americanus (Linnaeus, 1758)	Papa-terra, Judeu	Southern Kingcroaker	WA	NE	NE	NT
Micropogonias furnieri (Desmarest, 1823)	Corvina	Whitemouth Croaker	Ca+Br+SSWA	NE	NE	NFMP
Odontoscion dentex (Cuvier, 1830)	Pescada	Reef Croaker	Ca+Br	NE	NE	DD
Umbrina coroides Cuvier, 1830	Castanha-riscada, Corvina-riscada	Sand Drum	Ca+Br	NE	NE	NE
Mullidae						
Upeneus parvus Poey, 1852	Trilha	Dwarf Goatfish	WA	NE	NE	DD

Continued

Table 1. *Continued.*

Species	Local common names	English common names	Distribution	IUCN	BR	SP
Chaetodontidae						
Chaetodon striatus Linnaeus, 1758	Peixe-borboleta	Banded Butterflyfish	WA	LC	NE	NE
Kyphosidae						
Kyphosus incisor (Cuvier, 1831)	Pirajica	Yellow Sea Chub	TA	NE	NE	NE
Kyphosus sectatrix (Linnaeus, 1758)	Pirajica	Bermuda Sea Chub	TA	NE	NE	NE
Pomacentridae						
Abudefduf saxatilis (Linnaeus, 1758)	Sargentinho, Sinhá-rosa	Sergeant-Major	TA	NE	NE	NE
Scaridae						
Nicholsina usta usta (Valenciennes, 1840)	Budião	Emerald Parrotfish	WA	LC	NE	NE
Uranoscopidae						
Astroscopus y-graecum (Cuvier, 1829)	Miracéu	Southern Stargazer	WA	NE	NE	DD
Labrisomidae						
Labrisomus nuchipinnis (Quoy & Gaimard, 1824)	Guavina, Macaco	Hairy Blenny	TA	LC	NE	NE
Malacoctenus delalandii (Valenciennes, 1836)	Macaquino	Brazilian Blenny	Ca+Br	LC	NE	NE
Blenniidae						
Hypleurochilus fissicornis (Quoy & Gaimard, 1824)	Maria-da-toca	-	SWA	LC	NE	NE
Omobranchus punctatus (Valenciennes, 1836)	-	Muzzled Blenny	-	NE	NE	NE
Parablennius pilicornis (Cuvier, 1829)	Maria-da-toca	Ringneck Blenny	TA	LC	NE	NE
Scartella cristata (Linnaeus, 1758)	Peixe macaco	Molly Miller	TA	LC	NE	NE
Gobiidae						
Bathygobius soporator (Valenciennes, 1837)	Amboré	Frillfin Goby	TA+EP	NE	NE	NE
Ctenogobius boleosoma (Jordan & Gilbert, 1882)	Amboré, Rondon	Darter Goby	WA	NE	NE	NE
Ctenogobius smaragdus (Valenciennes, 1837)	Amboré, Maria-da-toca	Emerald Goby	WA	NE	NE	NE
Gobionellus stomatus Starks, 1913*	Amoré	-	Br	NE	NE	NE
Gobionellus oceanicus (Pallas, 1770)	Amoré	Highfin Goby	WA	NE	NE	NE
Microgobius meeki Evermann & Marsh, 1899*	Amborê	-	Ca+Br	NE	NE	NE
Eleotridae						
Butis koilomatodon(Bleeker, 1849)	Barrigudo, Dorminhoco	Mud Sleeper	-	NE	NE	NE
Ephippidae						
Chaetodipterus faber (Broussonet, 1782)	Paru, Enxada	Atlantic Spadefish	WA	NE	NE	NE
Sphyraenidae						
Sphyraena tome Fowler, 1903*	Bicuda, Barracuda	-	SSWA	NE	NE	DD
Trichiuridae						
Trichiurus lepturus Linnaeus, 1758	Peixe-espada	Largehead Hairtail	CT	NE	NE	NE
Scombridae						
Scomberomorus brasiliensis Collette, Russo & Zavala-Camin, 1978	Sororoca	Serra Spanish Mackerel	Ca+Br	LC	NE	DD
Pleuronectiformes						
Paralichthyidae						
Citharichthys arenaceus Evermann & Marsh, 1900	Linguado	Sand Whiff	Ca+Br	NE	NE	DD
Citharichthys macrops Dresel, 1885	Linguado	Spotted Whiff	WA	NE	NE	DD
Citharichthys spilopterus Günther, 1862	Linguado, Solha-linguada	Bay Whiff	WA	NE	NE	DD
Etropus crossotus Jordan & Gilbert, 1882	Linguado, Solha	Fringed Flounder	WA+EP	NE	NE	DD
Etropus longimanus Norman, 1933	Linguado	-	SSWA	NE	NE	DD
Syacium papillosum (Linnaeus, 1758)	Linguado	Dusky Flounder	WA	NE	NE	DD
Bothidae						
Bothus ocellatus (Agassiz, 1831)	Linguado	Eyed Flounder	WA	NE	NE	DD
Achiridae						
Achirus lineatus (Linnaeus, 1758)	Linguado, Solha	Lined Sole	Ca+Br+SSWA	NE	NE	DD
Cynoglossidae						
Symphurus tessellatus (Quoy & Gaimard, 1824)	Língua-de-mulata	Tessellated Tonguefish	Ca+Br+SSWA	NE	NE	DD
Tetraodontiformes						
Monacanthidae						
Stephanolepis hispidus (Linnaeus, 1766)	Peixe-porco	Planehead Filefish	TA	NE	NE	NE
Tetraodontidae						
Lagocephalus laevigatus (Linnaeus, 1766)	Baiacu	Smooth Puffer	WA	LC	NE	DD
Sphoeroides greeleyi Gilbert, 1900	Baiacu	Green Puffer	Ca+Br	LC	NE	DD
Sphoeroides spengleri (Bloch, 1785)	Baiacu	Bandtail Puffer	WA	LC	NE	DD
Sphoeroides testudineus (Linnaeus, 1758)	Baiacu	Checkered Puffer	WA	LC	NE	DD
Diodontidae						
Chilomycterus spinosus (Linnaeus, 1758)	Baiacu, Baiacu-de-espinho	Brown Burrfish	Br+SSWA	NE	NE	DD

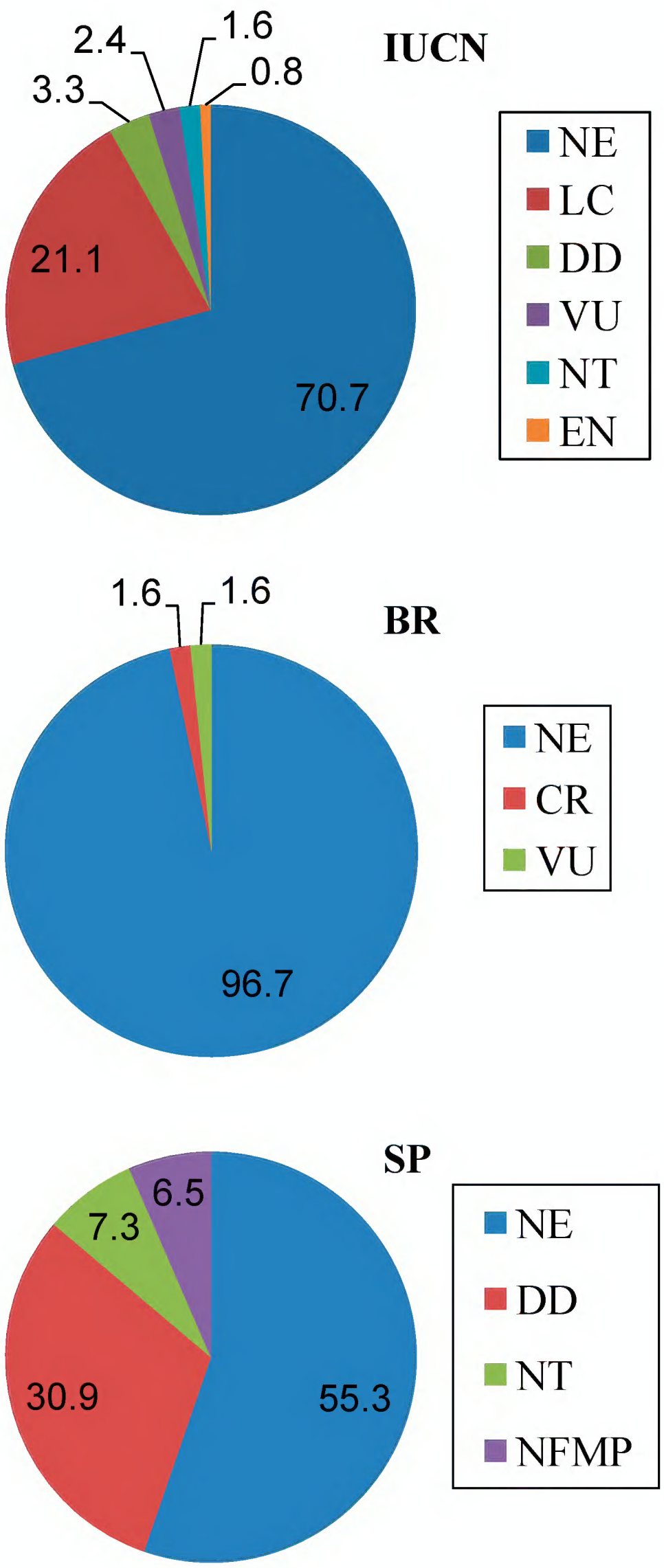

Figure 3. Relative frequency of the conservation status of species recorded in Araçá Bay (total richness = 126) in the IUCN Red List (IUCN 2014), in the federal list (BR; Brasil 2014), and in the state list (SP; Governo do Estado de São Paulo 2014). IUCN: NE – Not Evaluated; LC –Least Concern; DD – Data Deficient; VU – Vulnerable; NT – Near Threatened; EN – Endangered. BR: NE – Not Evaluated; VU – Vulnerable; CR –Critically Endangered. SP: NE – Not Evaluated; DD – Data Deficient; NT – Near Threatened; NFMP - Needed Fisheries Management Plan. For the IUCN classification criteria see 'The IUCN Red List of Threatened Species' (IUCN 2014), for the federal classification criteria see the Ordinance of the Ministry of Environment nº 445, of 17 December 2014 (Brasil 2014) and for the state classification criteria see the Decree Nº 60.133 of 7 February 2014 (Governo do Estado de São Paulo 2014).

Janeiro (Araújo et al. 2002), and Flamengo Cove, Ubatuba (Mattox et al. 2014). In Araçá Bay, as in those areas, the richest families in terms of species were Sciaenidae, Haemulidae, Paralichthydae, and Carangidae. In fact, such families, especially Carangidae and Sciaenidae, are commonly found throughout the Brazilian coast (Vazzoler et al. 1999).

Although potential differences in fish species composition may be due to differences in the sampling processes and protocols, a comparison of the Araçá Bay species composition to other southeastern Brazilian coastal ecosystems might be informative. The richness of Araçá Bay (126 spp.) is greater than on the Ubatuba shelf, where a total of 79 and 111 species were reported by Rocha and Rossi-Wongtschowski (1998), and Costa (2014), respectively. A lesser richness than in Araçá Bay was also found in adjacent regions of the SSC by Rossi-Wongtschowski et al. (2008), and Gibran and Moura (2012), who found 65 and 68 species, respectively. The high species richness encountered in the present study may be due to the varied (nine) gear types used, while the other studies used only one. These comparisons emphasize the importance of combining different sampling methods to attain a more complete picture of the species composition in fish assemblages (Olin and Malinen 2003). It is worth pointing out that Araçá Bay shares approximately half of its fish fauna with the SSC (43%, Lamas 2015), which suggests a considerable connectivity of species.

A bottom trawl survey carried out 20 years ago in the outer sublittoral of the Araçá Bay recorded the following species not recorded in the present study: *Chirocentrodon bleekerianus* (Poey, 1867), *Cyclopsetta chittendeni* Bean, 1895, *Dules auriga* Cuvier, 1829, *Epinephelus morio* (Valenciennes, 1828), *Hyporthodus nigritus* (Holbrook, 1855), *Ogcocephalus verpertilio* (Linnaeus, 1758), *Porichthys porosissimus* (Cuvier, 1829), *Sphoeroides tyleri* Shipp, 1972 and *Trinectes paulistanus* (Miranda Ribeiro, 1915) (Muto et al. 2000). The absence of these species in our samples may be due to sampling effort but also potential differences in fish community between 1994 and 2016. For this reason, these species have not been included in the present checklist.

Most of the fish fauna of Araçá Bay is either widely distributed throughout the subtropical and tropical Western Atlantic, or more restricted to the tropical region (i.e., occurring in both Caribbean and Brazilian Province), and there are also species more related to the temperate region (i.e., southern South West Atlantic). The geographic distribution pattern of Araçá fishes reflects the bay's location in the Argentinian zoogeographic province, which extends from Cabo Frio, Rio de Janeiro, to the Valdés Peninsula, Argentina (Caires 2014). The Argentinian zoogeographic province is a large faunistic transition zone, where tropical and

temperate fauna meets, but also has many endemic species (Caires 2014). Three of the endemic fish species, *Dasyatis hypostigma* Santos & Carvalho, 2004, *Sardinella brasiliensis,* and *Sphyraena tome* Fowler, 1903, were recorded in Araçá Bay.

With the expansion of the São Sebastião Port, habitat will be lost within the bay and a substantial increase in pollution from oil spills and sewage may be expected. These are threats to fish populations within the bay. We found legally endangered species, such as *Epinephelus marginatus* and *Gymnura altavela*, in Araçá Bay, which means that measures should be taken to protect their populations during and after the port expansion, as determined by federal legislation (Brasil 2014). Our results also found species in need of fishery management, such as *Hippocampus reidi, Lutjanus analis, Lutjanus cyanopterus, Micropogonias furnieri, Mugil liza, Rhinobatos percellens* and *Sardinella brasiliensis*, which emphasizes the inclusion of the bay in the regional fisheries planning.

Also important is the presence of two non-native species, *O. punctatus* and *B. koilomatodon*. These species were likely introduced into the bay with ballast water and as part of the biofouling communities on cargo ships that dock in the São Sebastião Port. With the port expansion, a substantial increase in ship traffic is expected, which increases the probability of new introductions. Non-native species pose a threat to native species by out-competing for habitat and resources (Contente et al. 2015; Contente et al. 2016).

Our study also determined that the conservation status of many species found in Araçá Bay, and elsewhere along the Brazilian coast, remains unevaluated. This may be a consequence of the paucity of biological and ecological data on these species, which are needed for ranking status. We found that species often received a different ranking in the state and federal lists, and that the state list classifies many more species as threatened than the federal one. This highlights the disparity of methods and criteria used (Gärdenfors 2001; Possingham et al. 2002).

This study provides the first checklist of the fish species of the Araçá Bay, with remarks on their distribution and conservation, which can be an important tool for future environmental impact, biogeographical and macroecological studies.

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LITERATURE CITED

Amaral, A.C.Z. and S.A.H. Nallin. 2011. Biodiversidade e ecossistemas bentônicos marinhos do Litoral Norte de São Paulo, Sudeste do Brasil. Campinas: UNICAMP/IB.

Amaral, A.C.Z., A.E. Migotto, A. Turra and Y. Schaeffer-Novelli. 2010. Araçá: biodiversidade, impactos e ameaças. Biota Neotropica 10(1): 219–264. doi: 10.1590/S1676-06032010000100022

Araújo, F.G., M.C.C. de Azevedo, M. de A. Silva, A.L.M. Pessanha, I.D. Gomes and A.G. da Cruz-Filho. 2002. Environmental influences on the demersal fish assemblages in the Sepetiba Bay, Brazil. Estuaries 25(3): 441–450. doi: 10.1007/BF02695986

Arruda, E.P. and A.C.Z. Amaral. 2003. Spatial distribution of Mollusks in the intertidal zone of sheltered beaches in southeastern of Brazil. Revista Brasileira de Zoologia 20(2): 291–300. doi: 10.1590/S0101-81752003000200020

Brasil. 2014. Ministério do Meio Ambiente - MMA. Portaria nº 445, de 17 de dezembro de 2014. Reconhecer como espécies de peixes e invertebrados aquáticos da fauna brasileira ameaçadas de extinção aquelas constantes da "Lista Nacional Oficial de Espécies da Fauna Ameaçadas de Extinção—Peixes e Invertebrados Aquáticos".

Brenha-Nunes, M.R., R.F. Contente and C.L.D.B. Rossi-Wongtschowski. 2016. A protocol for measuring spatial variables in soft-sediment tide pools. Zoologia 33(2): 1–4. doi: 10.1590/S1984-4689zool-20150165

Caires, R.A. 2014. Biogeografia dos Peixes Marinhos do atlântico sul ocidental: Padrões e Processos. Arquivos de Zoologia 45(esp.): 5–24. doi: 10.11606/issn.2176-7793.v45iespp5-24

Carpenter, K.E. 2002a. The living marine resources of the Western Central Atlantic. Volume 1: Introduction, mollusks, crustaceans, hagfishes, sharks, batoid fishes, and chimaeras. Rome: FAO. 1–600 pp.

Carpenter, K.E. 2002b. The living marine resources of the Western Central Atlantic. Volume 2: Bony fishes part 1 (Acipenseridae to Grammatidae). Rome: FAO. 601–1374 pp.

Carpenter, K.E. 2002c. The living marine resources of the Western Central Atlantic. Volume 3: Bony fishes part 2 (Opistognathidae to Molidae), sea turtles and marine mammals. Rome: FAO. 1375–2127 pp.

Consultoria Paulista de Estudos Ambientais. 2011. Relatório de Impacto Ambiental – RIMA: Plano Integrado Porto Cidade (PIPC). São Sebastião: Companhia Docas de São Sebastião. 52 pp. http://www.portodesaosebastiao.com.br/pt-br/rima/EIA_Rima_Porto_de_Sao_Sebastiao.pdf

Contente, R.F., M.R. Brenha-Nunes, C.C. Siliprandi, R.A. Lamas and V.R.M. Conversani. 2015. Occurrence of the non-indigenous *Omobranchus punctatus* (Bleniidae) on the São Paulo coast, south-eastern Brazil. Marine Biodiversity Records 8(73): 1–4. doi: 10.1017/S175526721500055X

Contente, R.F., M.R. Brenha-Nunes, C.C. Siliprandi, R.A. Lamas and V.R.M. Conversani. 2016. A new record of the non-native fish species *Butis koilomatodon* (Bleeker 1849) (Teleostei: Eleotridae) for southeastern Brazil. Biotemas 29(2): 113–118. doi: 10.5007/2175-7925.2016v29n2p113

Corte, G.N., L.Q. Yokoyama and A.C.Z. Amaral. 2014. An attempt to extend the Habitat Harshness Hypothesis to tidal flats: a case study of *Anomalocardia brasiliana* (Bivalvia: Veneridae) reproductive biology. Estuarine, Coastal and Shelf Science

150(A): 136–141. doi: 10.1016/j.ecss.2013.12.007

Costa, M.R. 2014. Composição e estrutura da comunidade de peixes em duas praias sob o mesmo tipo de pressão antrópica, litoral de São Paulo, Brasil. UNISANTA BioScience 3(3): 122–142. http://periodicos.unisanta.br/index.php/bio/article/view/219

Eschmeyer, W.N. 2014. Catalog of fishes: genera, species, references. Accessed at http://research.calacademy.org/research/ichthyology/catalog/fishcatmain.asp, 15 December 2014.

Figueiredo, J.L. 1977. Manuais de peixes marinhos do sudeste do Brasil: volume 1. São Paulo: Museu de Zoologia da Universidade de São Paulo. 104 pp.

Figueiredo, J.L. and N.A. Menezes. 1978. Manuais de peixes marinhos do sudeste do Brasil: volume 2. São Paulo: Museu de Zoologia da Universidade de São Paulo. 110 pp.

Figueiredo, J.L. and N.A. Menezes. 1980. Manuais de peixes marinhos do sudeste do Brasil: volume 3. São Paulo: Museu de Zoologia da Universidade de São Paulo. 90 pp.

Figueiredo, J.L. and N.A. Menezes. 2000. Manuais de peixes marinhos do sudeste do Brasil: volume 6. São Paulo: Museu de Zoologia da Universidade de São Paulo. 116 pp.

Gärdenfors, U. 2001. Classifying threatened species at national and global levels. Trends in Ecology and Evolution 16(9): 511–516. doi: 10.1016/S0169-5347(01)02214-5

Gibran, F.Z. and R.L. Moura. 2012. The structure of rocky reef fish assemblages across a nearshore to coastal islands' gradient in southeastern Brazil. Neotropical Ichthyology 10(2): 369–382. doi: 10.1590/S1679-62252012005000013

Gorman, D., C.E. Sikinger and A. Turra. 2015. Spatial and temporal variation in the predation risk for hermit crabs in a subtropical bay. Journal of Experimental Marine Biology and Ecology 462: 98–104. doi: 10.1016/j.jembe.2014.10.009

Governo do Estado de São Paulo. Decreto Nº 60.133, de 7 de fevereiro de 2014. Declara as Espécies da Fauna Silvestre Ameaçadas de extinção, as Quase Ameaçadas e as deficientes em dados para avaliação no Estado de São Paulo e dá providências correlatas. 2014.

Gubitoso, S., W. Duleba, A.C. Teodoro, S.M. Prada, M.M. Rocha, C.C. Lamparelli, J.E. Bevilacqua and D.O. Moura. 2008. Estudo geoambiental da região circunjacente ao emissário submarino de esgoto do Araçá, São Sebastião (SP). Revista Brasileira de Geociências 38(3): 467–475. http://ppegeo.igc.usp.br/scielo.php?script=sci_arttext&pid=S0375-75362008000500004&lng=pt&nrm=iso

Hellmann, J.J. and G.W. Fowler. 1999. Bias, precision, and accuracy of four measures of species richness. Ecological Applications 9(3): 824–834. doi: 10.1890/1051-0761

IUCN (International Union for the Conservation of Nature). 2014. IUCN Red List of threatened species. Version 2014.3. Accessed at http://www.iucnredlist.org, 5 December 2014.

Lamas, R.A. 2015. Banco de dados biológicos e ecológicos da ictiofauna da Baía do Araçá, São Sebastião (SP) [unpublished report]. São Paulo: Instituto Oceanográfico, Universidade de São Paulo. 56 pp.

Mace, G.M. 2004. The role of taxonomy in species conservation. Philosophical Transactions of the Royal Society 359: 711–719. doi: 10.1098/rstb.2003.1454

Mattox, G.M.T., G.F. Gondolo and P.T.M. Cunningham. 2014. Long-term variation in the ichthyofauna of Flamengo Cove, Ubatuba, São Paulo. Arquivos de Zoologia 45(esp.): 51–61. doi: 10.11606/issn.2176-7793.v45iespp51-61

Menezes, N.A. and J.L. Figueiredo. 1980. Manuais de peixes marinhos do sudeste do Brasil: volume 4. São Paulo: Museu de Zoologia da Universidade de São Paulo. 96 pp.

Menezes, N.A., J.L. Figueiredo. 1985. Manuais de peixes marinhos do sudeste do Brasil: volume 5. São Paulo: Museu de Zoologia da Universidade de São Paulo.105 pp.

Migotto, A.E., C.G. Tiago and A.R.M. Magalhães. 1993. Malacofauna marinha da região costeira do Canal de São Sebastião, SP, Brasil: Gastropoda, Bivalvia, Polyplacophora e Scaphopoda. Boletim do Instituto oceanográfico 41(1/2): 13–27. doi: 10.1590/S0373-55241993000100002

Muto, E.Y., L.S.H. Soares and C.L.D.B. Rossi-Wongtschowski. 2000. Demersal fish assemblages off São Sebastião, southeastern Brazil: structure and environmental conditioning factors (summer 1994). Revista Brasileira de Oceanografia 48(1): 9–27. doi: 10.1590/S1413-77392000000100002

Olin, M. and T. Malinen. 2003. Comparison of gillnet and trawl in diurnal fish community sampling. Hydrobiologia 506–509: 443–449. doi: 10.1023/B:HYDR.0000008545.33035.c4

Passos, A.C., R.F. Contente, C.C.V. de Araujo, F.A.L. de M. Daros, H.L. Spach, V. Abilhôa and L.F. Fávaro. 2012. Fishes of Paranaguá Estuarine Complex, South West Atlantic. Biota Neotrópica 12(3): 226–238. doi: 10.1590/S1676-06032012000300022

Petracco, M., R.M. Camargo, D.T. Tardelli and A. Turra. 2013. Population biology of the gastropod *Olivella minuta* (Gastropoda, Olividae) on two sheltered beaches in southeastern Brazil. Estuarine, Coastal and Shelf Science 150(A): 149–156. doi: 10.1016/j.ecss.2013.10.015

Possingham, H.P., S.J. Andelmanb, M.A. Burgmanc, R.A. Medellínd, L.L. Mastere and D.A. Keithf. 2002. Limits to the use of threatened species lists. Trends in Ecology and Evolution 17(11): 503–507. doi: 10.1016/S0169-5347(02)02614-9

Rocha, G.R.A. and C.L.D.B. Rossi-Wongtschowski. 1998. Demersal fish community on the inner shelf of Ubatuba, southeastern Brazil. Revista Brasileira de Oceanografia 46(2): 93–109. doi: 10.1590/S1413-77391998000200001

Rossi-Wongtschowski, C.L.D.B., L.S.H. Soares and E.Y. Muto. 2008. Ictiofauna; pp. 381–403, in: A.M.S. Pires-Vanin (ed.). Oceanografia de um ecossistema subtropical: plataforma de São Sebastião, SP. São Paulo: Editora da Universidade de São Paulo.

Rossi-Wongtschowski, C.L.D.B., C.C. Siliprandi and R.F Contente. 2015. Peixes da Baía do Araçá, São Sebastião – SP – Brasil. São Paulo: Uhôa Cintra Comunicação Visual e Arquitetura. 16 pp.

Silveira, R.B. 2011. Registros de cavalos-marinhos (Syngnathidae: Hippocampus) ao longo da costa brasileira. Oecologia Australis 15(2): 316–325. doi: 10.4257/oeco.2011.1502.09

Silveira, L.F., B. de M. Beisiegel, F.F. Curcio, P.H. Valdujo, M. Dixo, V.K. Verdade, G.M.T. Mattox and P.T.M. Cunningham. 2010. Para que servem os inventários de fauna? Estudos Avançados 24(68): 173–178. doi: 10.1590/S0103-40142010000100015

Teodoro, A.C., W. Duleba and S. Gubitoso. 2011. Estudo multidisciplinar (geoquímica e associações de foraminíferos) para caracterizar e avaliar intervenções antrópicas na Baía do Araçá, Canal de São Sebastião, SP. Geologia USP. Série Científica 11(1): 113–136. doi: 10.5327/Z1519-874X2011000100007

Vazzoler, A.E.A. de M., L.S.H. Soares and P.T.M. Cunningham. 1999. Ictiofauna da costa brasileira; pp. 424–467, in: R.H. Lowe-Mcconnell (ed.). Estudos ecológicos de comunidades de peixes tropicais. (A.E.A. de M. Vazzoler, A.A. Agostinho and P.T.M. Cunningham, translators). São Paulo: Editora da Universidade de São Paulo.

Zanardi, E., M.C. Bícego, L.B. de Miranda and R.R. Weber. 1999. Distribution and origin of hydrocarbons in water and sediment in São Sebastião, SP, Brazil. Marine Pollution Bulletin 38(4): 261–267. doi: 10.1016/S0025-326X(98)90143-6

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APPENDIX

Table A1. Voucher number of specimens deposited in the Zoological Museum of the University of São Paulo. Species are in alphabetic order.

Voucher number	Species
MZUSP 118862	*Abudefduf saxatilis*
MZUSP 118863	*Achirus lineatus*
MZUSP 118864	*Albula vulpes*
MZUSP 118865	*Anchovia clupeoides*
MZUSP 118866	*Anchoviella lepidentostole*
MZUSP 118867	*Anchoa lyoleps*
MZUSP 118868	*Anisotremus surinamensis*
MZUSP 118869	*Anchoa tricolor*
MZUSP 118870	*Anisotremus virginicus*
MZUSP 118871	*Archosargus rhomboidalis*
MZUSP 118872	*Astroscopus y-graecum*
MZUSP 118873	*Atherinella brasiliensis*
MZUSP 118874	*Bathygobius soporator*
MZUSP 118875	*Bothus ocellatus*
MZUSP 118876	*Caranx latus*
MZUSP 118877	*Calamus penna*
MZUSP 118878	*Centropomus parallelus*
MZUSP 118879	*Centropomus undecimalis*
MZUSP 118880	*Chloroscombrus chrysurus*
MZUSP 118881	*Chaetodipterus faber*
MZUSP 118882	*Chilomycterus spinosus*
MZUSP 118883	*Chaetodon striatus*
MZUSP 118884	*Citharichthys arenaceus*
MZUSP 118885	*Citharichthys macrops*
MZUSP 118886	*Citharichthys spilopterus*
MZUSP 118887	*Cosmocampus elucens*
MZUSP 118888	*Ctenogobius boleosoma*
MZUSP 118889	*Ctenosciaena gracilicirrhus*
MZUSP 118890	*Ctenogobius smaragdus*
MZUSP 118891	*Cynoscion jamaiscensis*
MZUSP 118892	*Cynoscion leiarchus*
MZUSP 118893	*Dasyatis guttata*
MZUSP 118894	*Dasyatis hypostigma*
MZUSP 118895	*Dactylopterus volitans*
MZUSP 118896	*Diplodus argenteus*
MZUSP 118897	*Diplectrum formosum*
MZUSP 118898	*Diplectrum radiale*
MZUSP 118899	*Diapterus rhombeus*
MZUSP 118900	*Elops saurus*
MZUSP 118901	*Epinephelus marginatus*
MZUSP 118902	*Etropus crossotus*
MZUSP 118903	*Etropus longimanus*
MZUSP 118904	*Eucinostomus argenteus*
MZUSP 118905	*Eugerres brasilianus*
MZUSP 118906	*Eucinostomus gula*
MZUSP 118907	*Eucinostomus melanopterus*
MZUSP 118908	*Genidens genidens*
MZUSP 118909	*Gobiesox barbatulus*
MZUSP 118910	*Gobionellus oceanicus*
MZUSP 118911	*Gobiesox strumosus*
MZUSP 118912	*Gymnothorax occelatus*
MZUSP 118913	*Harengula clupeola*
MZUSP 118914	*Haemulopsis corvinaeformis*
MZUSP 118915	*Haemulon steindachneri*
MZUSP 118916	*Hemicaranx amblyrhynchus*
MZUSP 118917	*Hemiramphus brasiliensis*
MZUSP 118918	*Hipoccampus reidi*
MZUSP 118919	*Hypleurochilus fissicornis*
MZUSP 118920	*Hyporhamphus roberti*
MZUSP 118921	*Hyporhamphus unifasciatus*
MZUSP 118922	*Kyphosus incisor*
MZUSP 118923	*Kyphosus sectatrix*
MZUSP 118924	*Larimus breviceps*
MZUSP 118925	*Lagocephalus laevigatus*
MZUSP 118926	*Labrisomus nuchipinnis*
MZUSP 118927	*Lutjanus analis*
MZUSP 118928	*Lutjanus cyanopterus*
MZUSP 118929	*Lutjanus synagris*
MZUSP 118930	*Lycengraulis grossidens*
MZUSP 118931	*Malacoctenus delalandii*
MZUSP 118932	*Menticirrhus americanus*
MZUSP 118933	*Micropogonias furnieri*
MZUSP 118934	*Mugil curema*
MZUSP 118935	*Mugil hospes*
MZUSP 118936	*Mugil incilis*
MZUSP 118937	*Mugil liza*
MZUSP 118938	*Mycteroperca acutirostris*
MZUSP 118939	*Myrophis punctatus*
MZUSP 118940	*Nicholsina usta usta*
MZUSP 118941	*Odontoscion dentex*
MZUSP 118942	*Oligoplites saliens*
MZUSP 118943	*Oligoplites saurus*
MZUSP 118944	*Ophichthus gomesii*
MZUSP 118945	*Opisthonema ogliunum*
MZUSP 118946	*Orthopristis ruber*
MZUSP 118947	*Parablennius pilicornis*
MZUSP 118948	*Pellona harroweri*
MZUSP 118949	*Pomatomus saltatrix*
MZUSP 118950	*Polydactylus virginicus*
MZUSP 118951	*Poecillia vivipara*
MZUSP 118952	*Prionotus punctatus*
MZUSP 118953	*Rhinobatos percellens*
MZUSP 118954	*Sardinella brasiliensis*
MZUSP 118955	*Scomberomorus brasiliensis*
MZUSP 118956	*Scartella cristata*
MZUSP 118957	*Scorpaena brasiliensis*
MZUSP 118958	*Scorpaena plumieri*
MZUSP 118959	*Selene setapinnis*
MZUSP 118960	*Selene vomer*
MZUSP 118961	*Sphoeroides greeleyi*
MZUSP 118962	*Sphoeroides spengleri*
MZUSP 118963	*Sphoeroides testudineus*
MZUSP 118964	*Stephanolepis hispidus*
MZUSP 118965	*Strongylura marina*
MZUSP 118966	*Strongylura sp*
MZUSP 118967	*Strongylura timucu*
MZUSP 118968	*Synodus foetens*
MZUSP 118969	*Syacium papillosum*
MZUSP 118970	*Symphurus tesselatus*
MZUSP 118971	*Trachinotus carolinus*
MZUSP 118972	*Trachinotus falcatus*
MZUSP 118973	*Trachinotus goodei*
MZUSP 118974	*Trichiurus lepturus*
MZUSP 118975	*Trachinocephalus myops*
MZUSP 118976	*Tylosurus acus*
MZUSP 118977	*Umbrina coroides*
MZUSP 118978	*Upeneus parvus*